

GIA Environmental Health and Safety Confined Space Entry Standard

DOCUMENT IDENTIFIER: A-SP-ELMF799-00-0000 Rev A, 12-Jan-1993

ABSTRACT: This GIA standard defines the basic elements and responsibilities of a site Confined Space Entry Program.

APPLICABILITY: This standard shall apply to GIA facilities and operations worldwide, except where superceded by more stringent country or local regulations.

STATUS: APPROVED 12-Jan-1993; use VTX SMC for current status.

This document is confidential and proprietary, and is the property of Digital Equipment Corporation. This is an unpublished work protected under applicable copyright laws.

© Digital Equipment Corporation 1993. All rights reserved.

GIA Environmental Health and Safety Confined Space Entry Standard

DOCUMENT IDENTIFIER: A-SP-ELMF799-00-0000 Rev A, 12-Jan-1993

REVISION HISTORY:

No previous revision exists.

Document Management Category:

Environmental Health and Safety (MEH)

Responsible Department:

GIA Environmental Health and Safety

Responsible Person:

Jerry Gaudet

SMC Writer:

Eric Falkof

APPROVAL: This document has been reviewed and recommended for approval by the General Review group for its category.

Jerry Gaudet - GIA Manufacturing and Engineering

Direct requests for further information to:

Karen Crawford

Use \$ VTX ELF for the latest location information.

Use VTX SMC to order copies of this document from Standards and Methods Control. Send distribution questions to JOKUR::SMC or call DTN: 234-4423.

The DIGITAL logo is a trademark of Digital Equipment Corporation.

UL is a registered trademark of Underwriters Laboratories.

CONTENTS

1 INTRODUCTION	1
1.1 SCOPE	1
1.1.1 Policy	1
1.2 RESPONSIBILITIES	1
1.3 LANGUAGE REQUIREMENT FOR THIS STANDARD	3
1.4 DEFINITIONS	3
2 PROGRAM ELEMENTS	5
2.1 IDENTIFICATION OF CONFINED SPACES	5
2.2 TRAINING	5
2.3 ACCESS BY PERMIT ONLY	6
2.4 CONTINGENCY PLANNING	6
2.5 EMERGENCY PROCEDURES	6
2.6 ISOLATION PROCEDURES	6
2.7 PRE-ENTRY REQUIREMENTS	7
2.7.1 General Evaluation	7
2.7.2 Testing and Monitoring	7
2.7.3 Purging and Ventilation	8
2.7.4 Ignition Sources	8
2.8 WORK PRACTICES	8
2.8.1 Tools and Equipment	8
2.8.2 Lighting	9
2.8.3 Cylinders	9
2.8.4 Personal Protective Equipment (PPE)	9
2.8.5 Warning Signs	9
2.8.6 Standby Person	9
2.9 OTHER CONFINED SPACE HAZARDS	9
2.9.1 Temperature Extremes	9
2.9.2 Engulfment Hazards	10
2.9.3 Noise	10
2.9.4 Slick or Wet Surfaces	10
2.9.5 Falling Objects	10
2.9.6 Ergonomics	10
Appendix A REFERENCED DOCUMENTS	11
A.1 Digital Documents, EL-Class	11
A.2 Documents External to Digital	11
A.3 Ordering Information	11
Appendix B RELATED DOCUMENTS	13
B.1 Digital Documents, EL-Class	13
B.2 Ordering Information	13

1 INTRODUCTION

The purpose of this GIA standard is to define the basic elements and responsibilities of a site Confined Space Entry Program.

A confined space is one that, by design, has limited openings for entry and exit, has unfavorable natural ventilation that could contain or produce dangerous air contaminant levels, and is not intended for continuous employee occupancy. See the complete definition under subhead 1.4.

1.1 SCOPE

This standard shall apply to GIA facilities and operations worldwide, unless superseded by more stringent country or local regulations.

1.1.1 Policy

Each site shall identify the confined spaces that exist within the boundaries of the property and shall ensure that a program is in place that protects the health and safety of employees and contract employees who work in and around confined spaces.

1.2 RESPONSIBILITIES

Responsibilities of persons involved in fulfilling the requirements of this document are as follows.

- Site Manager
 - Provide the site Confined Space Entry Program with adequate time, support, and resources to ensure that all appropriate program related activities, including training, are conducted.
- Department Manager or Supervisor
 - Understand and ensure full implementation of the Confined Space Entry Program as it affects employees and contractors.
- Site Environmental Health and Safety (EH&S)
 - Develop and ensure site compliance to the site Confined Space Entry Program.
 - Ensure that employees and contract employees are trained in the Confined Space Entry Program, including emergency entry and exit procedures, use of respirators, first aid, lockout procedures, safety equipment use, permit systems, and confined space work practices. Rescue and training drills designed to maintain proficiency shall also be included.
 - Ensures that an appropriate signatory procedure is in place to ensure no unqualified or unauthorized personnel enter any confined space. For example, the employee's supervisor might sign the entry permit to verify that all necessary pre-entry requirements have been met.
 - Administer the permit record retention system.

Evaluate confined spaces to determine hazard potential.

Conduct air monitoring before personnel entry and during the work procedure in a confined space.

Maintain records of atmospheric testing.

Determine the required personal protective equipment (PPE) for each specific job to be conducted within a confined space.

Approve for use all equipment, chemicals, or tools before they are brought into a confined space.

- Permanent and Contract Employees and Plant Maintenance

Provide proof of training equivalent to or exceeding Digital's training requirements for confined spaces.

Provide their own PPE for use in confined space.

Abide by all Digital policies and procedures, including entry by permit, atmospheric pretesting, presence of a trained standby person while in the confined space, and so forth.

Obtain a medical evaluation and all necessary approvals. Secure a permit prior to entering a confined space.

- Site Health Services

Establish and administer medical examinations to ensure only those who are medically qualified are allowed to work in a confined space. This examination should include respirator approval certification.

Ensure that the medical evaluation takes into account the environment in which the person will be working.

Schedule initial employee medical evaluations and annual re-evaluations.

Ensure that the standby person is certified in cardiopulmonary resuscitation (CPR) and basic first aid and that there is proper first aid equipment present for the work to be performed in the confined space.

Maintain records of all medical evaluations, both of employees and contract employees.

Notify department managers or supervisors, and EH&S which employees or contract employees are certified for entrance into confined space.

- Area EH&S

Develop and communicate specific GIA confined space entry policies and standards.

Provide assistance in the development of procedures, tools, training, and mechanisms to assist GIA sites and operations in complying with these policies.

Assist, where needed, in generating site specific confined space entry procedures.

1.3 LANGUAGE REQUIREMENT FOR THIS STANDARD

The details of this GIA standard and all documentation associated with it, such as manuals, training materials, signs, labels, postings, and so forth, must be available in English and the accepted and official local languages.

1.4 DEFINITIONS

Specific terms related to confined space entry that are used in this standard are defined in this section.

Blanking

Inserting a solid barrier across the open end of a pipe leading into or out of the confined space, and securing the barrier to prevent leakage of material into the confined space. The barrier must withstand the maximum upstream pressure.

Carbon monoxide (CO)

A colorless, odorless gas that, when in high concentrations, can cause unconsciousness with little or no warning. As CO concentrations rise, the harmful effects also rise.

Confined space

A space that, by design, has limited openings for entry and exit, has unfavorable natural ventilation that could contain or produce dangerous air contaminant levels, and is not intended for continuous employee occupancy.

Because air may not move in and out of confined spaces freely due to the design, the atmosphere inside a confined space can be very different from the atmosphere outside. Deadly gases may be trapped inside, particularly if the space is used to store or process chemicals or organic substances that may decompose. There may not be enough oxygen inside the confined space to support life, or the air could be so oxygen-rich that it is likely to increase the chance of fire or explosion if an ignition source is present.

Most confined spaces are not designed for workers to enter and work in on a routine basis. They are designed to store a product, enclose materials and processes, or transport products or substances. Therefore, occasional worker entry for inspection, maintenance, repair, cleanup, or similar tasks may pose potential hazards, such as chemical and physical hazards for which precautions must be taken.

Confined spaces include, but are not limited to, manholes, storage tanks, silos, boilers, incinerators, pits, sewers, air handler, ventilation and exhaust ducts, tunnels, vats, degreasers, underground utility vaults, and pipelines.

CPR

Cardiopulmonary resuscitation.

Hot work

Any work involving burning, welding, riveting, or similar fire or heat producing operations, as well as work that produces a source of ignition such as drilling, abrasive blasting, and space heating.

Hydrogen sulfide (H_2S)

An easily detectable gas which, at low concentrations, has an odor similar to rotten eggs. H_2S desensitizes the olfactory sense; therefore, to those people who have been exposed to it for extended periods of time, the gas may seem to have dissipated even though the concentration may have remained constant or even increased. Low concentrations (20-150 parts per million) cause eye irritation, while slightly higher concentrations may cause upper respiratory tract irritation. If exposure is prolonged, pulmonary edema or asphyxiation may occur. The danger increases when high concentrations go undetected.

Isolation

The process by which a confined space is removed from service and completely protected against the inadvertent release of potentially hazardous material. The following methods are commonly used to isolate a confined space:

- Blanking off (skillet type metal blank between flanges)
- Removal or misalignment of sections of all lines and pipes
- Double block and bleed system
- Electrical lockout of all sources of power
- Blocking or disconnecting all mechanical linkages

LEL or LFL (Lower Explosive Limit or Lower Flammability Limit)

The lowest air-fuel concentration at which a gas can ignite. Concentrations below this range are too lean to burn. Lean mixtures of gas can be enriched and reach flammable levels.

Lockout/tagout

The placement of a lock or tag on the energy-isolating device in accordance with an established procedure, indicating that the energy-isolating device shall not be operated until removal of the lock or tag. Refer to EL-MF744-00 *GIA Environmental Health and Safety Lockout / Tagout of Energy Sources Standard*.

Oxygen deficient atmosphere

Contains less than 19.5% oxygen by volume. Oxygen deficiency can occur even after an area has been purged of toxic gases. The gases may emanate from porous walls and sludge. Undetected leaks, organic decomposition, bacterial action, combustion, and cleaning processes can lead to the displacement of oxygen by other gases, causing the atmosphere to become toxic. As other gas level(s) increase, oxygen levels decrease, creating the potential for injury and fatality. Oxygen also can be absorbed by the wall of areas being repaired or cleaned, causing further oxygen deficiency. The importance of monitoring for adequate oxygen levels is as critical as sampling for the presence of other gases. Failure to monitor properly may result in an undetected increase in toxic gases or a reduction in oxygen.

Oxygen enriched atmosphere

Contains more than 25% oxygen by volume. The presence of too much oxygen in a confined space can be fatal in certain situations. In the correct concentration, oxygen, fuel, and an ignition source can result in explosion or fire. When oxygen rises above its normal level of 21%, the flammability range of combustible gases increases. To avoid the possibility of

oxygen enrichment explosions, confined areas shall not be purged with oxygen in place of air. Proper site procedures for blanking of oxygen lines shall be followed.

Respirator

An approved device that has been designed to protect the wearer from inhalation of hazardous atmospheres. Refer to EL-MF775-00 *GIA Environmental Health and Safety Respiratory Protection Standard*.

SCBA

Self-contained breathing apparatus

Standby person (or attendant)

A person trained in emergency rescue procedures, who is stationed outside the confined space, monitors the authorized entrants inside the confined space, and is in communication with those authorized entrants. The standby person also ensures nonauthorized personnel do not enter the confined space. The exception to this is rescue personnel who are adequately protected and may enter the confined space to rescue a fallen worker.

2 PROGRAM ELEMENTS

A site Confined Space Entry Program must contain provision for those items described in the following subheads.

2.1 IDENTIFICATION OF CONFINED SPACES

All confined spaces within property boundaries shall be identified. Procedures about how to control the identified confined spaces and any potential hazards shall be established and implemented.

2.2 TRAINING

Personnel responsible for supervising, planning, entering, or participating in a confined space entry or rescue shall be adequately trained in their functional duties prior to any confined space entry.

Training for testing and monitoring personnel shall include the proper use of atmospheric monitoring instruments. This shall include field calibration, basic knowledge of the work being performed, the anticipated hazardous contaminants, and any process that could significantly alter original conditions inside or outside the confined space.

Training for standby personnel shall include summoning rescue or other emergency services, the proper use of equipment used to communicate with entry and rescue personnel, CPR, and basic first aid.

Training for emergency response personnel shall include plans and procedures for each type of confined space they may encounter, locations (to minimize response time) and configuration of confined spaces on site, proper use of emergency rescue equipment, CPR, and first aid.

Yearly assessment of employee training effectiveness will be performed, and retraining will be held yearly at a minimum, or more frequently if personnel or job requirements change.

2.3 ACCESS BY PERMIT ONLY

A permit system shall be used to control access to the confined space. The permit authorizes and approves the location and type of work to be done, and it certifies that all existing hazards have been evaluated and protective measures have been taken to ensure the safety of all confined space workers.

The permit shall be dated and carry an expiration time that will be valid for one shift only. The permit shall also specify job safety requirements, such as PPE, ventilation, and so forth.

2.4 CONTINGENCY PLANNING

The work should be planned thoroughly ahead of time and potential dangers should be anticipated.

2.5 EMERGENCY PROCEDURES

There shall be a written plan that includes:

- How to determine which rescue methods are appropriate for retrieving confined space workers
- The rescue personnel that are immediately available
- The type and availability of rescue equipment
- How to summon rescue personnel quickly
- A schedule for rescue training drills
- Rescue procedures

Breathing equipment

All rescue personnel must use SCBA or Airline/SCBA breathing equipment when entering a confined space to rescue a worker. The buddy system shall be used when attempting a rescue. It should also be noted that in some instances, there will be space constraints such that a SCBA will not be able to be worn during the rescue. Refer to EL-MF775-00.

Rescue equipment inspection

All equipment shall be inspected monthly and before entry into a confined space to ensure it is working properly.

2.6 ISOLATION PROCEDURES

Before work begins, confined spaces shall be completely isolated from all other systems by physical disconnection, lockout or tagout, or blanking of all lines. Systems that should be disconnected include pipes, air lines, electrical equipment, mechanical devices, and machinery. Refer to EL-MF744-00.

Electrical isolation of the confined space is achieved by locking circuit breakers and disconnects in the OFF position with padlocks.

Mechanical isolation of moving parts is achieved by disconnecting linkages or removing drive belts or chains.

If a drain line is located within the confined space, provision shall be made to tag it and leave it open.

2.7 PRE-ENTRY REQUIREMENTS

Prior to entering a confined space, it is required that personnel evaluate, test, and ensure safe working conditions. The following subheads describe these requirements in detail.

2.7.1 General Evaluation

Prior to entering a confined space, all potential hazards shall be identified. Hazards shall be evaluated with respect to their scope and magnitude, likelihood of a hazard occurrence, consequences of that occurrence, potential for changing conditions, strategies for controlling the hazards, and potential emergency response requirements.

2.7.2 Testing and Monitoring

Testing of confined spaces shall be conducted prior to entry. The confined space shall be vented prior to occupancy, as well as throughout the entire time the space is occupied.

The site Industrial Hygienist will assess the confined space for potential hazards and determine what testing shall be performed. The following tests may need to be performed using equipment that is explosion-proof and equipped with an audible alarm or danger signaling device. Instruments shall be calibrated according to manufacturers' instructions. Calibration records shall be filed with the site EH&S manager and retained for at least one year after the last calibration.

Oxygen content level

The percentage of oxygen allowed for entry into a confined space shall be no less than 19.5% and no greater than 25% by volume. If the oxygen level falls below 19.5%, an oxygen deficient atmosphere exists. The area shall not be entered without being purged with air or without approved respiratory protection equipment, if necessary. If the oxygen level exceeds 25%, an oxygen enriched atmosphere exists. Hot work shall be prohibited until ventilation has reduced the level to 21%.

Carbon monoxide concentrations

Carbon monoxide concentrations shall not exceed 50 parts per million.

Hydrogen sulfide (H_2S)

Hydrogen sulfide (H_2S) concentrations shall not exceed 10 parts per million.

Combustible gases

A combustible gas indicator shall be used to check for the presence of explosive gases that may include methane or hydrogen. The monitoring range should be below the lower explosive limit (LEL) to provide advanced warning. The reading shall not exceed 10% of the lower explosive limit of any combustible material.

Flammable liquids and gases

Oxygen levels in a confined space shall be determined before measuring the range of flammability to make the necessary corrections in the flammability measurement. Entry into a confined space shall be prohibited if the concentration of flammable gases is greater than 10% of the lower flammable limit (LFL) or lower explosive limit (LEL) for any particular liquid.

Toxicity

Any confined space that may contain potentially toxic substances shall be measured for the substances using proper instrumentation, and shall be identified by the site Industrial Hygienist. Entry into a confined space shall be prohibited if the concentration of toxic materials exceeds country or local occupational health standards. If no standards exist, refer to the most recent version of the *Threshold Limit Values (TLV)* published by the American Conference of Governmental Industrial Hygienists (ACGIH).

2.7.3 Purging and Ventilation

Environmental control in a confined space is accomplished by purging and ventilating. The area shall be ventilated or purged with air, when possible. The method used will be determined by the potential hazards that arise from the product being stored or produced, suspected contaminants, the work to be performed, and the design of the confined space.

After pre-entry testing and *before* work begins, the confined space shall be purged and vented to remove any hazardous vapors. If a gas other than air has been used to purge the tank, monitor the confined space to ensure that the gas used to purge the tank has also been removed. Use local exhaust where general exhaust is not practical. *Never* block the exit with ventilation equipment.

When ventilation cannot keep contaminants below acceptable limits, appropriate respiratory protection is required. Equipment providing ventilation to control toxic contaminants and flammable vapors or gases shall have an alarm device to indicate power failure.

2.7.4 Ignition Sources

Employees shall remove matches, cigarette lighters, two-way radios, or other potential ignition sources prior to entering a confined space where flammable vapors or gases might accumulate. No-sparking tools must be used where the potential exists for the accumulation of toxic or flammable gases.

2.8 WORK PRACTICES

Work practices in confined spaces require special tools and equipment considerations. The following subheads described these practices and considerations.

2.8.1 Tools and Equipment

Portable electric tools, equipment, and lighting shall be approved in accordance with local regulations. All ground connections on electrical equipment shall be checked before that equipment is used in a confined space. All tools shall be inspected for defects before they are used in a confined space.

Air-driven power tools shall *not* be used when flammable liquids and gases are present. These tools will reduce but not eliminate the risk of explosion. Explosions can arise from overheated tools, from sparks produced by striking or grinding, or from the discharge of electrostatic charges accumulated during the flow of compressed air.

2.8.2 Lighting

Lighting shall be of explosion-proof design and where necessary, shall be equipped with guards. Only equipment listed by Underwriters Laboratories (UL), an independent testing laboratory, or equivalent agency shall be used. Lighting shall not be hung by electric cords unless specifically designed for that purpose. The work area shall be sufficiently illuminated to provide safe working conditions. Under no circumstances will matches or open flames be used to illuminate a confined space.

2.8.3 Cylinders

Cylinders of compressed gases shall not be taken into confined spaces. Exception: cylinders that are part of self-contained breathing apparatus or resuscitation equipment are allowed.

2.8.4 Personal Protective Equipment (PPE)

Site EH&S shall specify the PPE required for each specific job to be performed in a confined space. Most jobs will require some type of PPE such as hardhats, gloves, boots, eye protection, hearing protection, protective clothing, and footwear. Respiratory protection equipment shall be determined based upon the conditions in the confined space, the test results from the confined space, and the work to be performed.

Depending on the hazard, additional safety equipment such as a safety belt, body harness secured to a lifeline, safety net, or life jacket shall also be used. Lifelines may be needed if there is a space constraint that does not allow the use of an SCBA.

2.8.5 Warning Signs

These include warnings for entry permits, respirator use, prohibition of hot work, emergency procedures, and telephone numbers. Ensure these are visible during work.

A barricade with a mechanism to prevent closure of the confined space escapeway may be needed if inadvertent entry to the confined space poses a problem.

2.8.6 Standby Person

At all times, a standby person must be posted within sight of the person inside the confined space. The standby person should not enter the confined space but should call for help in an emergency. The standby person outside the confined space should maintain communication at all times with authorized workers inside the confined space.

2.9 OTHER CONFINED SPACE HAZARDS

The following subheads describe other confined space hazards; this listing is representative and does not include all other possible hazards.

2.9.1 Temperature Extremes

Extremely hot or cold temperatures can present problems for workers. For example, if the space has been steamed, it should be allowed to cool before any entry is made.

2.9.2 Engulfment Hazards

Loose, granular material such as grain, sand, or similar material that is stored in bins and hoppers can engulf and suffocate a worker. The loose material can form a crust or bridge over a bin and break loose under the weight of a worker.

2.9.3 Noise

Noise within a confined space can be amplified because of the design and acoustic properties of the space. The noise level shall be monitored and controls put in place if necessary. Excessive noise can damage hearing. It can also affect communication by causing a shouted warning to go unheard.

2.9.4 Slick or Wet Surfaces

Slips and falls can occur on a wet surface, causing injury or death. Also, a wet surface increases the likelihood of and the effect of electric shock when electrical circuits, equipment, and tools are used. Controls shall be put in place to minimize the risk of slips, falls, and electrical shock. These controls may include drying the area, use of battery operated equipment, and so forth.

2.9.5 Falling Objects

Workers in confined spaces should be alert for the possibility of falling objects, particularly in spaces with topside openings for entry and where work is being done above and around the worker.

2.9.6 Ergonomics

The very nature of confined spaces may lead to the need for specialized equipment (both PPE and tools) as well as specific work procedures to cope with the tight, restrictive spaces. Refer to EL-MF741-00, *GIA Environmental Health and Safety Cumulative Trauma Disorder (CTD) Prevention Standard*.

APPENDIX A REFERENCED DOCUMENTS

A.1 Digital Documents, EL-Class

Document Number	Document Title
EL-MF741-00	<i>GIA Environmental Health and Safety Cumulative Trauma Disorder (CTD) Prevention Standard</i>
EL-MF744-00	<i>GIA Environmental Health and Safety Lockout/Tagout of Energy Sources Standard</i>
EL-MF775-00	<i>GIA Environmental Health and Safety Respiratory Protection Standard</i>

A.2 Documents External to Digital

Document Number	Document Title
	<i>Threshold Limit Values (TLV)</i>

A.3 Ordering Information

Use VTX SMC to order copies of EL-class documents from Standards and Methods Control. Send distribution questions to JOKUR::SMC or call DTN: 234-4423.

Following are the sources for documents not available from Standards and Methods Control.

- American Conference of Governmental Industrial Hygienists (ACGIH)
6500 Glenway Ave.
Bldg. D-7,
Cincinnati, OH 45211-4438

APPENDIX B RELATED DOCUMENTS

B.1 Digital Documents, EL-Class

Document Number	Document Title
EL-MF738-00	<i>GIA Environmental Health and Safety Working Alone Standard</i>
EL-MF740-00	<i>GIA Environmental Health and Safety Electrical Safety Standard</i>
EL-MF748-00	<i>GIA Environmental Health and Safety Construction Contractor Safety Standard</i>

B.2 Ordering Information

Use VTX SMC to order copies of EL-class documents from Standards and Methods Control. Send distribution questions to JOKUR::SMC or call DTN: 234-4423.

----- READER COMMENTS Your comments and suggestions will help Standards and Methods Control improve their services and documents. -----

Did you request this document? _____ If so, did it arrive within a satisfactory period of time? _____ Please comment.

What are your impressions of this document? Consider format, organization, completeness, readability, and illustrations.

-----**FOLD ON THIS LINE**-----

Did you find technical or clerical errors in this document? If so, please specify the page number(s) and the error(s).

Are the instructions for the update package clear? _____
 Was an index available? _____ If not, is one needed? _____
 Do you have other suggestions for improving this document?

The following information is optional:

Name _____ Mailstop _____
 Department _____ Node _____

Send your comments to JOKUR::PROJECTS, or fold, staple, and send this page through interoffice mail to:

----- READERS' COMMENTS STANDARDS AND METHODS CONTROL NRO5/I2 -----
--

